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The Editor, Mr. Walter L. Necker is absent in the Armed Service. The printer is forced to use bold face type in the absence of italics. This number contains some of the publisher's papers. It is hoped that others will submit manuscripts for the next issue..

NOTES ON CYCLURA

By C. B. LEWIS

The early distribution of the Jamaican iguana, **Cyclura collei**, is difficult to determine closely, but according to the meagre records, it occurred on the "south-eastern slopes of Jamaica". P. H. Gosse, the English Naturalist who, a century ago, spent eighteen months on the island, confesses that he never saw a living example. However, Richard Hill provided him with a specimen on which he based the description of a new species:: **Cyclura lophoma** (1). With the description Gosse quotes Hill as follows:- " 'It is found only in particular parts of the Island—the low limestone chain from Kingston to Goat Island on to its continuation.'." It seems quite certain that in the days of Hill and Gosse, the Healthshire Hills supported a large Cyclura population. The Portland Point region would appear to be a most suitable habitat for the lizards, as suggested by Grant, (2) but apparently they have never occurred there, for no skeletal remains have been found in the abundant caves or in the many Arawak kitchen middens of the area.

In 1872 a species of mongoose was introduced into Jamaica to destroy rats which abounded in the cane-fields. For the first decade after its introduction the mongoose was of great benefit to the cane planters, but unfortunately the ichneumon did not confine its attention to the rats. All types of terrestrial wild life suffered including the Cyclura; the mongoose is said to have preyed upon the eggs and the young lizards with amazing thoroughness. The species has probably been extinct on the main island of Jamaica for at least twenty years, but a remnant colony on the Goat Islands in Portland Bight has kept the species extant.

Together, Great Goat Island and Little Goat Island, may cover one thousand acres (including large areas of mangrove swamps) and, in the east, Great Goat rises to about 350 feet. We do not know exactly when the mongoose reached the Goat Islands, but it was apparently between 1920 and 1925. Fearing the very numerous yellow snakes **(Epicrates subflavus)** and disliking the iguanas, fishermen and woodcutters from Old Harbour Bay took several mongoose across hoping that they would reduce the objectionable and abundant reptile population. The several mongoose were prolific and they and their progeny were most efficient and effective in the carrying out of their appointed duties. The yellow snake has not been seen on either of the Goat Islands for many years and the scarcity of the Cyclura has been consistently reported since 1930.

In 1940 arrangements were being made to wage a mongoose-extermination campaign and to declare the Goat Islands wild life sanctuaries. These plans had to be abandoned when it was learned that the islands were to be included in the U. S. Base Area, but an immediate effort was made to remove as many of the remaining live specimens of Cyclura as could be caught. Over a spasmodic collecting period of six months, 22 iguanas were captured, and a number of others were seen. The captured individuals have been kept in a pen in the garden of the Institute of Jamaica, in Kingston.

Males seemed quite definitely to be more numerous than

females—a population condition which is, I believe, considered typical of a decadent and expiring species. In fact, no females were seen or caught (at least 8 males had been taken) until the breeding season came on, and the females were probably more or less concentrated in a limited area. In contrast to this preponderance of males we might mention the condition of the colonies of **Cyclura macleayi caymanensis** of Cayman Brac and Little Cayman. Males of **caymanensis** are rarely seen and in the 35 examples known to have been collected (Major Grant coll. 8, Brit. Mus. (Nat. Hist.) 17, Oxford Univ. Mus. 1, Mus. Comp. Zool., Harvard 1, Inst. of Ja. 8) the male sex is represented by a single young individual: a mounted specimen in the Oxford Museum. The colonies of Cyclura on these two islands are reproducing, generally flourishing and are in no danger of extinction.

For at least a decade now, no partly grown or young Cyclura have been taken or seen on the Goat Islands; all but three of those which we captured were definitely aged. Several of the specimens captured had cancerous growths; these were so extensive on the left forefoot of one male that it was difficult for the animal to walk. Another animal had a malignant infection behind the left jowl. All of the specimens captured by labourers had injuries which eventually caused death. The labourers who were clearing the mangroves, slaughtered several of the big lizards as tell-tale remains found on the islands bore evidence.

Today only five males and three females survive at the Institute. The captives feed well but they have shown no inclination to breed; possibly they are too aged. The species is, indeed nearing total extinction for it no longer exists on Little Goat Island and perhaps only half a dozen individuals remain today on Great Goat Island.

The distribution of the Cyclura on Great Goat Island was found to be remarkably limited and relatively comparable to the reportedly original distribution of the species on the main island of Jamaica. The lizards seemed to be concentrated on the steep eastern and south-eastern slopes. As has al-

ready been mentioned, no females were taken, or for that matter seen, except during the egg-laying season apparently late March to early May. The nest-making activities are usually carried out low on the eastern hillside and all females were taken in this region. Males were usually discovered at the top of the hill.

As Major Chapman Grant has pointed out, Cyclura is reported to climb trees to eat leaves. At this time some positive evidence can be recorded on this alleged habit about which herpetologists have been doubtful. Late in April, 1941, while descending the south-east slope of Great Goat Island with Dr. E. A. Chapin of the U. S. National Museum, an iguana dropped from a tree, passing only a few feet from my face in its descent. I cannot give the exact height from which it dropped, but it was from branches well above my head and I believe that the lizard was at least nine feet from the ground. The tree was a slim one and quite erect although it bore many branches commencing at a low height. I cannot with certainty give the sex of the lizard, but I believe that the individual was a female. The area was densely wooded and heavy with undergrowth; in consequence, the iguana escaped.

Gosse's observation regarding the Cyclura (3) as "seen lying out on the branches of trees, or playing bow-peep from a hole in the trunk" has been somewhat discredited. **Cyclura macleayi caymanensis,** a close relative of **C. collei,** is commonly seen basking on the inclined gnarled trunks and branches of the button mangrove **(Conocarpus)** and the limbs of dead red mangroves **(Rhizophora).** The climbing ability of Cyclura has been proven in the enclosure at the Institute of Jamacia in Kingston: both **collei** and **caymanensis** are quite capable of climbing a smooth fence post and have done so whenever an opportunity presented itself. Gosse's statement was not based on his own observation but perhaps it was fairly accurate after all.

I have never found a nest with eggs of **Cyclura collei**. Evidence of digging by the female was usually found within 30 feet of the mangrove swamp at the foot of the south-east slope of Great Goat Island. My notes on the nesting habits of **C. macleayi caymanensis** have been quoted at length by Major Grant (4) and it may be expected that the habits of **collei** are similar. My observations on the nesting habits and eggs of Cyclura coincide remarkably with a very interesting account of Cyclura written in the middle of the seventeenth century by duTertre (5). This early French naturalist relates that Cyclura come down from the mountains during May to lay 13 to 25 eggs in a heap in the sand on the sea-shore. **C. caymanensis** was found to conform to those observations. There is no sandy beach on the Goat Islands thus the "red earth" just above the mangrove would be the most nearly comparable site available. duTertre quotes Rochefort as saying that Cyclura will lay eggs elsewhere if sand is too distant or otherwise inaccessible. On Grand Cayman, **Cyclura macleayi lewisi** is said to have been common in former years along the north coast particularly east of Old Man Bay, where there is a wide sandy coastal shelf. The people hunted the species for food and in one way or another the population has been greatly reduced. According to the evidence of our searches in 1938, the species no longer frequents the coast,—not even during the breeding season—but digs nests in the earth in the more or less secure uninhabited east central portion of Grand Cayman.

In captivity several **collei** have laid a few eggs but they have never attempted to bury them properly. The **caymanensis** thrives in captivity but unfortunately we have not been able to obtain a male of the species. A fine active male of **collei** lives peaceably with the females of **caymanensis** but will not breed with them.

THE PRESENT STATE OF THE JAMAICAN IGUANA

With the establishment of the U. S. Naval Station in Portland Bight, the Jamaican Iguana, **Cyclura collei,** was exterminated except on Great Goat Island. During February, 1944, an assistant well versed in the habits of the species, and an expert at catching them, spent 5 days searching Great Goat Island in order to ascertain the present condition of the remnant colony. One female was captured on the South Coast not far from the water's edge, and only 4 other individuals were seen. The captured female had just completed moulting and was in splendid condition. It has been placed in a newly constructed pen, approximately 15 yds x 12 yds, with the best male from the Institute collection. It is hoped that this pair may be induced to breed, thus far all attempts to induce iguanas to reproduce in captivity have been unsuccessful.

References

1. Gosse, Philip, 1848, Proc. Zool. Soc. London.
2. Grant, C. 1940, "The Herpetology of Jamaica" Part II. Bull. of Inst. of Ja. Science Series No. 1. pp. 97-100.
3. Gosse, Philip, 1851, "A Naturalist Sojourn in Jamacia". pp. 76-77.
4. Grant, C. 1940. "The Herpetology of the Cayman Islands". Bull. of Inst. of Ja. Science Series No. 2. pp. 29-35.
5.. duTertre, R. P., 1667. "Histoire Generale des Antilles." Vol. II. pp 308-312.

MORE "THOUGHTS ON SUBSPECIES"

By CHAPMAN GRANT

Taxonomists have been guided in the naming of species and subspecies by certain well established customs or rules which are well known to the students who have specimens to classify. That these rules have been codified is beside the point of this paper. The taxonomist and student, often one and the same, work together with mutual satisfaction until someone brings out a formula which would tend to upset these rules of convenience. Several recent examples of this kind are reviewed here.

We assume that ancient man named objects to distinguish between them. When he devised written language these names were haphazardly spelled, but the appearance of the index necessitated uniformity in spelling. Fixed names are now used by naturalists to make indexing possible. To accomplish this end the only necessity is a jumble of letters in fixed order and preferably pronounceable. Any further service than pure indexability which is given to a name, such as being descriptive or naming a place etc., is entirely unnecessary although possibly of interest.

By general usage a population within a genus which differs from every other population, is called a SPECIES. Theoretically specimens must be 100% determinable by inspection as to species and assignable to the locality which that species is known to inhabit. As a matter of fact many specimens lose some of their distinguishing characters when preserved although they may be readily identified in the field. Occasionally intergrades are found which inhabit the territory between what had been considered the ranges of two apparently distinct species. By definition the existence of intergrades automatically reduces the species in question to the status of SUBSPECIES. Conversely stated, if the intergrades occurring in the territory between two subspecies be exterminated, the separated groups which exhibit fixed differences, become "full" species.

A graphic representation of what we believe to be the usually accepted definitions of species and subspecies, might be represented thus:

Let "A" represent a population lower than a genus. Let the numerals 1 to 20 represent a progressively varying factor or factors found in this population at different geographical localities thus:

A1, A2, A3, A4, A5, A6, A7, A8, A9, A10, and so on to A20.

Here we see that A1 is markedly different from A20, but regardless of the differences between these extremes, we find that there is a gradual variation in space without a break in either space or variation. By definition, all specimens of this group belong to one species. A1 to A20 may be broken down into various SUBSPECIES under one condition. If A1 and A2 have differences that are CONSTANT in at least SOME part of their respective ranges, then each may be called a subspecies restricted to that part of the range where differences 1 and 2 are constant. Between "constant" areas, A1 and A2 show intergradation and these specimens are assignable to whichever subspecies they most nearly resemble.

If for some reason A1 and A20 survive and all the intermediates become extinct, then A1 and A20 have become full species regardless whether they could mate if brought together. They are very distinct species and do not necessarily indicate the direction of relationship. If A1, A2, A3 and A18, A19, A20 survive and the intermediates become extinct, we have the same two species as defined above, also with the possibility of being broken down into subspecies, and in addition we see clues to show the direction of relationship.

We may find A1 — A20 with all intermediates stretching across the country and in addition A20 occupying the whole or a great part of the range. A20 is therefore a distinct species since it does not intergrade in any of its range. This brings us to the axiom that TWO SUBSPECIES CANNOT INHABIT THE SAME RANGE. Thus a large series of specimens may be collected at one place and show considerable variation. If by plotting these variations in graphic form, it can be shown

that a sufficient break occurs to show that there is no interbreeding of the two groups, two separate species are involved. These two could not be called two subspecies, because by definition subspecies would interbreed forming all variations between the two extremes. This is an example of the necessity of working with sufficiently large series. The size of the series needed varies in different genera. A large series of one species makes a large series of a close relative unnecessary. Thus 200 specimens might show the variations A1 through A3. A single specimen of A6 might be sufficient to prove it a distinct species, assuming the nonexistence of A4 and A5.

We have said that the geographically separated A1 and A20 are distinct or full species when all intermediates have disappeared although A1 and A20 might mate if brought together. This is not a refutation of the definitions stated above because A1 and A20 **are** separate and cannot mate in nature. However, if A1 and A20 from their separate ranges repopulate the intervening territory and then interbreed at the zone of meeting, they automatically reduce themselves to subspecies, since all the intergrades A2 through A19 will be present.

Sometimes subspecies are described from specimens taken at widely separted localities without data from intervening territory and consequently without proof of intergradation and consequently without proof but what they are full species. The more frequent sin is to describe two subspecies from the same locality. This is obviously an impossible situation, because if a series of specimens from one locality can be divided into two series with overlapping characteristics, it is evident that a species of wide individual variation has been construed as two species. This error is committed with unfortunate frequency. When two populations occupy the same territory and their differences are slight but not intergrading, it is evident that they form two distinct species.

More data are necessary and more responsibility is taken by the systematist in naming a subspecies than if he were naming a full species, because the fact of intergrading and the zone in which intergrading occurs, should be known and desig-

nated. In describing a species the impossibility of the existence of intergrades is often obvious. In the case of insular subspecies the intergrades may be on one island or on the adjacent mainland.

Unfortunately there are "splitters" and "lumpers" who upset the existing order by regrouping or adding or removing names without apparent justification. The splitter uses or mistakes individual variations for specific characters and may endeavor to assign subspecies to every hilltop. The lumper overlooks specific characters in reducing the number of species. Some are known to split in genera in which they are specializing and lump in genera in which others have specialized. Possibly these latter should be known as "splimpers". This is a matter of relative personal opinion, but nevertheless a mid-ground can and should be striven for.

In 1934 Dunn (1), promulgated his "75% law". Briefly; if 75% of a population is assignable by insepction to the proper geographical locality and the form intergrades with another, also 75% recognizable, two valid subspecies exist. The remaining 25% is assignable to either. This apparently places Dunn in the splitter class, but in the genus **Mabouya**, (2) he apparently lumps. If this is so he would qualify as a splimper. He makes some concise statements:

"The duty of the taxonomist is to classify on the basis of anatomy, not geography."

"Unless well over half of the specimens can be correctly assigned to their proper population without knowledge of locality, the procedure should not apply racial names to the two populations."

"The taxonomist's business is not to speed up or anticipate evolution."

"In short, if intermediates exist between species, the species are not species but subspecies."

To illustrate a possible fallacy in Dunn's 75% law, let us consider localities "A" and "B" and populations with variations "x" and "y".

"A" contains a population 75%x and 25%y; "B" has a

population 25% x and 75% y. Dunn's law would have "x" a subspecies at "A", and "y" a subspecies at "B" because they can be 75% allocated by inspection.

Let us take 200 specimens for identification to Dr. Dunn; 100 each from "A" and "B", not labeled as to name or locality. He would probably assign 100 specimens of character "x" to "A" and 100 of "y" to "B", thus apparently determining two distinct species. Actually the specimens represent only a cline or disproportionate individual variation in both localities and therefore belong to but one species.

Barbour (4), applied trinomials to many insular forms "to show relationship in this way" as he mentions in his introduction. His trinomials are made without specific remark and without naming localities of intergradation. He inferentially changes the definition of subspecies, applying trinomials to closely related full species that have no known intergrades. At the same time he places the describer's name in parenthesis a change which had heretofore been made only when a species was switched to a different genus.

We might maliciously suggest the use of the trinomial with the specific name of the parent species placed in parentheses thus: "A—— b—— c—— (Smith)" would be changed to "A—— (b——) c—— Smith". This system would identify the work of the "close-relationists" and at the same time remove the parentheses.

McAtee (5), admits that he is a splitter and says that those who disagree with "millimeter differences" should ignore subspecies. He says: " . . . named or unnamed, subspecies of some degree are present in each differentiation area. This is a phenomenon of nature, not a fancy of man."

"A safe rule would be not to attempt subspecific identification except of known breeding birds very precisely labeled as to locality."

His classification by locality, not anatomy, seems to be an extreme in one dircetion.

Jepson (6) says: "No genus has any vested rights on account of long usage or approval by great masters. Continued

research, increased knowledge and an enlarged viewpoint must continually find vent in new generic expressions. Otherwise devotion to the past becomes a species of mental slavery wholly at variance with the spirit of scientific research. Similar observations apply to the species unit."

Dr. Leonhard Stejneger obligingly answered a query from the writer, in these words in a letter dated Oct. 19, 1937: "Roughly put as they are, the following ideas have guided all my work. I do not believe in any rules or regulations as to what is species or subspecies, etc. The whole trouble is that authors usually confound nature with nomenclature. Nomenclature legitimately has only one function, viz. to name objects, not to explain their origin, their relationships, their phylogenetic history, evolution or what not. In nature there are no two species alike, if indeed there are any species in nature, and no system of nomenclature can adequately represent their relations, even if we know them. Such a system at best only represents the particular author's individual interpretation, and — as many zoologists, as many minds! And what is also to the point: the author's interpretation is based only upon a limited number of specimens in museums. What guarantee has he, or we that the 75% in his collection is 75% in nature? In nomenclature this is a matter of judgment and convenience. What one author deems convenient for the expression of his judgment is possibly not convenient to his colleague; and what is convenient in one case may not be convenient in another, and what I judge convenient to-day may not be convenient tomorrow."

"As far as I remember I have nowhere expressed an opinion as to the name of the Jamaican **Cyclura.** In our card catalog our specimen is registered under the name given by Gosse and adopted by Cope, viz. **lophoma.** However, it is several years younger than Gray's **collei** of which it is a synonym. For obvious reasons we do not make it a point to change names in the card catalog unless they are "wrong" (incorrect), and **lophoma** is not wrong, it is only younger."

Since starting this paper Dunn has published a paper (3)

wherein he abandons his earlier dictum to the effect that 75% of the specimens of a subspecies must be so distinct that unlabeled specimens could be assigned to the geographical localities whence they came. Possibly he has considered the dilemma in which a classifier would find himself if confronted with the problem mentioned earlier in this paper.

In spite of the fact that the title of the Criteria includes "subspecies", Dunn abandons the term in favor of "race". His subhead of "subspecies" is followed by " . . races (subspecies) . . ". Thereafter he uses the terms indiscriminately. He says; "As a herpetologist . . . I am in agreement with the following notions . . ; species are 'distinct self-perpetuating units' . . discontinuous from other species; subspecies (or races) are populations within a species, as many as may be considered recognizable . . ".

His definition evidently precludes the possibility that individuals of a group within a species would be unable to or refuse to mate with individuals of other groups within that species. Otherwise we would be dealing with two species according to the same definition. Nevertheless in his diagram on page 127 he shows under "2.a.", three contiguous rectangles representing geographical ranges of populations "A" and "B" which are 100% pure or invariable. The center rectangle contains "A 50%" and "B 50%" with no intergradation whatever. This can only mean that A and B do not mate although they occur in the same locality. We believe the diagram admirably represents two distinct species with overlapping ranges according to his definition.

On page 128 Dunn says: "I can predict with confidence that with double the present material **Caecilia** would be a monotypic genus, with 16 races, as many as five of which might occur together and remain distinct." This statement coincides with Dunn's diagram, but according to his definition it appears that **Caecilia** would become a genus of five distinct species and eleven subspecies.

Dr. Barbour has read the foregoing in MS and has kindly submitted the following paragraph in a letter dated Dec.

23, 1943.

"Roughly put as they are, the following items have guided all my work; I do not believe in any rules or regulations as to what are species or subspecies.' The whole matter of parenthesis being present or absent, or where, is of no interest or importance whatever in my eyes. I do, however, admit frankly, that for years I was constrained to the general thesis that these island populations only slightly dissimilar though they be and showing no intergradation, should be called species. I maintained this stand for years. Then, in the face of the universal usage of the bird and mammal people, I switched in the last list and I may go back in the next one if I ever live to write it. I may add Myers of Stanford has written a splendid article bearing on this general subject. I think perhaps the best practice may be to dig up old names, of which there are plenty, and cut the genus Anolis into a lot of genera. I hold no brief for subgenera. They only are nomenclatorial nuisance but there is good reason indeed that **Anolis equestris, Anolis maynardi** and **Anolis loysiana,** for instance, really represent three jolly good genera."

A purely hypothetical example of what the writer understands to be the originally approved thoughts on subspecies might be stated thus: Consider that by artificial selection we have established white and black leghorn chickens from a parent brown form. Let us liberate a number of the brown ones in a given area; we will liberate the black ones in another area some distance to one side and the white on the opposite side. The conditions are favorable and after a few years the populations expand and we find brown-black and brown-white spotted populations occuping zones of intergradation. Now scientist Smith invades the brown area and names the species **Leghorn brown.** Scientist Jones later passes through the brown-black zone and finds a population of black chickens which he names **Leghorn brown black.** The original discovery is automatically changed to **Leghorn brown brown** Smith (without parenthesis). In his description Jones mentions that there is a certain zone of intergradation and he of course under-

stands that the brown and the black cannot occupy the same territory and retain the characters by which he has established the black subspecies and he can point to the intergrading zone to bear him out. Later he collects in the opposite direction and finds the brown-white and finally the white populations which he names **Leghorn brown white** similarly to what he had previously done in the case of the blacks. He probably states that the black and white subspecies were derived from the brown. Had the white population been discovered first, the discoverer might have named it and then the black and considered the browns and spotted as intergrades. This would have been a matter for his judgment, but having set the scene for him we would know that he was wrong. Under natural conditions his judgment might have been unassailable. Had the brown and spotted chickens all died before the advent of Smith and Jones these worthies would have correctly named **Leghorn black** and **Leghorn white** as full species in spite of the fact that **if** brought together they could and would intergrade.

We believe that the taxonomist's duty is to help scientific researchers as much as possible and not to cater to his own convenience. Probably this can be best accomplished by steering a midcourse and adhering to custom. He should remember that he is merely a classifier—a dictionary writer—not an inventor.

We wrote Dr. Dunn on Sept. 25, 1943, asking him some questions on his above quoted statements in the "Criteria". His answer came on Jan. 26, 1944. The questions asked were:

1. You used to hold that an unlabeled specimen should be susceptible of allocation to its proper range by inspection. You make no such statement in the present paper. Q. Is that for brevity or have you changed your definition?

2. The term "subspecies" appears useful and not susceptible of misinterpretation whereas "race" and "variety" are possible of confusion. Do you really believe that "race" has any advantages over "subspecies"?

3. On page 126 you say; "It is generally held that at least 75% . . . " Can you mention some authorities who have

adopted the 75% law?

4. Your diagram on page 127 under "2" without intermediates, is a fine diagram of two species with overlapping ranges. It would appear that since the ranges do overlap and there is no intergradation, that you are dealing with two distinct species. Please explain how you use this diagram to illustrate subspecies?

Dr. Dunn's interesting letter follows. It is quoted without his permission because of apparent impossibility to get mail through and because his friends will be glad to hear news of him.

"Instituto de Ciencias Naturales, Bogota, Columbia, Jan. 13, 1944. My dear Major Grant: By some freak chance about the only piece of ordinary mail I have received in six months, your letter of Sept. 25, has reached me here.

I am up around 9000 feet and doing very well. I have gotten a good bit of nice material myself and a museum here has about 3500 specimens. I just pick new species off the shelf.

Not having a copy of the "criteria" at hand I can only answer from memory, and will probably lay myself wide open.

1. Allocation of an unlabeled specimen to proper range by inspection: not sure I ever held that belief as a complete general proposition. I would say yes in the case of species, if the opposite is true then not good species. Subspecies if there are doubtful specimens. In the case of subspecies, practically by definition, some specimens can't be allocated.

2. I think with you that the term subspecies is useful, but it has often been used without a geographical connotation to mean variety. Race has almost always had a geographical connotation. Variety has almost never had one.

3. The 75% business. I was merely putting a figure roughly on what I had found to be procedure (by Stejneger, Barbour and lots of others).

4. About the diagram on p. 127. It is a diagram of two species with overlapping ranges as you say. It is also a diagram of two subspecies without intermediates. The latter

case is I believe and hope rare, but it exists.. It can only be proved by finding out that the two forms occur in the same brood, may be brothers, or parent and child, or mate together regularly, etc. In short, biological or field evidence.

Mrs. Dunn is with me and we will be going back to the States in June. Down here for a year. The one local **Hyla** has been described as a new species five times from Bogota. The local "monotypic" genus of lizard consists of at least four good species. So it goes. Best piece of luck so far was running into eggs of a frog that carries tadpoles to water (eggs laid on land under a rock and take ten days to hatch) we got everything from egg to adult. Very sincerely, E. R. Dunn."

SUMMARY

1. A full species is a distinct population.

2. A subspecies is a geographical subdivision of a species which intergrades with another population of the same species occupying different territory.

3. Two subspecies cannot occupy the same territory.

4. Scientific nomenclature is for the purpose of indexing.

References:

(1) E. R. Dunn, Systematic procedure in herpetology, Copeia, 1934, pp. 167-172.

(2) — — — , Notes on American mabuyas., Proc. Acad. Nat. Sci. Phila., 1935. Vol. 87, pp. 533-557.

(3) — — — , Lower categories in herpetology., pp. 123-131 in Criteria for vertebrate subspecies, species and genera., Ann. N. Y. Acad. Sci., Vol. 44, Art. 2, June 8, 1943.

(4) Thomas Barbour, Third list of Antillean reptiles and amphibians., Bull. Mus. Comp. Zool., 1937. Vol. 82 pp. 77-166.

(5) W. L. McAtee, Thoughts on subspecies. Scientific Monthly., Oct., 1941, pp. 368-371.

(6) W. L. Jepson, A manual of the flowering plants of California., 1923-1925., pp. 1-1238.

HERPETOLOGICAL NOTES ON ST. CROIX, VIRGIN ISLANDS

By CHAPMAN GRANT and HARRY A. BEATTY

Mr. Harry A. Beatty of Christiansted, St. Croix has sent several interesting collections and valuable field notes to the writer since his last paper covering this region. (1). Several interesting facts are brought out and an additional species is recorded from St. Croix. The quotations are from letters received from Mr. Beatty.

Eleutherodactylus antillensis (Reinhardt & Luetken)

"One evening in Christiansted I heard strange calls and I began a search which revealed the frog which I send. It was showery weather. About ten were calling." The specimen proved to be a typical, average-sized **E. antillensis** which is probably the species referred to by the writer on p. 505 when **E. portoricensis** Schmidt was listed with a question mark as probably the species liberated. Mr. Beatty reported that in 1937 a Puertorican had liberated a number of "coqui", the Puertorican vernacular for this species. Thus it is possible that **antillensis** has become established and that **portoricensis** was not introduced.

Leptodactylus albilabris Gunther

"I am sending the largest specimen of **L. albilabris** I ever saw. I am yet puzzled to explain by what method the young are transported to water unaided." During the breeding season a sharp edge develops on the snout of the parent. With this it digs a burrow under a stone or several stones at the edge of the creek. At the end of the tunnel there is a small nest lined with bubbles or froth. The young tadpoles occupy this nest which is several inches above water level.

All St. Croix specimens of **albilabris** that we had previously seen had been exceedingly small. This specimen was similar to the average St. Thomas specimens which are smaller, darker and less attractive than the occasional red or green marked specimens from the lowlands of Puerto Rico. Prior to seeing this specimen the writer had believed that a pigmy

race inhabited St. Croix as the specimens seen had not been over one quarter the size of the Puerto Rico specimens.

The distribution of **Sphaerodactylus** on St. Croix.

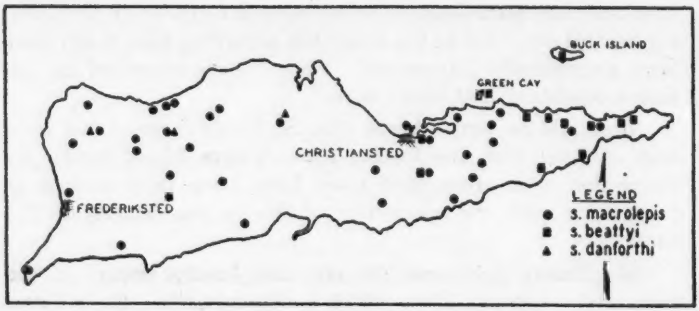
"The distribution of **S. macrolepis** Gunther is general and abundant on the western portion of the island and at points where this species meets **S. beattyi** Grant.. The latter occurs in cactus and desert-like terrain, at isolated points where the scant accumulation of leaves affords some protection. It does not occur in the hills, but is the only form found on Buck Island and Green Cay. On St. Croix opposite these islets both forms are found. This suggests that **beattyi** was an endemic form and that **macrolepis** is an introduced form which is crowding **beattyi** out. All of the amphibia occurring here could have been accidentally introduced. Many forms abundant on adjacent islands do not occur here."

It should be remembered that St. Croix is separated by a deep channel from the Puerto Rico—Virgin Island bank. Its connection with other land must have been very ancient in comparison with the connection of the various islands on the bank.

Mr. Beatty points out the fact that **beattyi** occurs on the main island opposite islets which it also inhabits. He believes that there must be some significance to this fact. The writer has noted similar cases. He found that **Typhlops granti** Ruthven & Gaige and **Phyllodactylus martini** Van Lidth de Jeude both occur on Caja de Muertos islet off Ponce, Puerto Rico and also at Parguera, almost adjacent to that islet. On the islet of Santiago, immediately adjacent to Playa Humacao, Puerto Rico there is a colony of **Anolis cristatellus** (Dumeril & Bibron) with exceptionally high tail fins, apparently an undescribed subspecies. At Playa Humacao an occasional equally high-finned specimen is taken. An occasional moderately high-finned specimen may be seen in various parts of Puerto Rico. These cases seem to point to accidental introduction by human agency. The writer has never found any evidence of "flotsam" introduction.

Mr. Beatty plotted his **Sphaerodactylus** finds as shown on

the accompanying map. This shows that **macrolepis** has a general distribution except for the eastern extremity of the island and Buck Island and Green Cay; **beattyi** occurs only east of Christiansted; **danforthi** Grant, is found sparingly in the northwestern hilly portion. Finding **danforthi** establishes a new record for St. Croix. This species was known only from Culebra and Vieques and an apparently identical form occurs on Anegada.



St. Croix, Virgin Islands , U. S. is about 22 miles long and lies south of the Virgin Island bank and separated therefrom by a deep channel. East of Christiansted the island is entirely hilly; west of Christiansted the north two thirds is hilly up to about 800 feet; the southern third is a flat alluvial plane. Buck island is a steep hill; Green Cay is flat. **S. macrolepis** occurs throughout the island, sparingly at the eastern extremity; **beattyi** occurs only east of Christiansted and on Buck Id. and Green Cay; **danforthi** is found only in the northwestern hills.

The collections sent the writer by Mr. Beatty included the following species in the numbers noted from the localities mentioned. Mr. Beatty presented the specimens to the M. C. Z.

S. macrolepis Gunther

38 Fountain Estate
17 Good Hope
16 Crequi Stream
1 Protestant Cay
4 Tagus Point
19 La Grange
11 Green Cay (town)
11 Mt. Victory Est.
5 Caledonia
2 Castle Burke Str.
2 Cotton Valley
2 Creque hilside
2 Mt. Eagle
14 River Estate
7 Sweet Bottom Anally
7 Sweet Bottom
5 Crequi
3 Sandy Point
14 Davis Estate hillside
18 Caanan
9 Concordia Str.
4 Prosperity Garden
10 Granard
3 South Gate Farm
3 Grove Place
11 Fair Plain
7 Lowry Hill
5 Petronella
10 Spring Gut 400'
11 Montpellier
8 Mt. Welcome
6 Sally's Fancy
35 St. George Est.
7 Grange water hole
Total 330 specimens

S. beattyi Grant

3 Green Cay islet
3 Cotton Grave
4 Buck Island
2 Cotton Valley
11 Spring Gut 400'
6 Knight, East End
12 Mt. Welcome
Total 41 specimens.

S. danforthi Grant

1 Mt. Victory
1 Fountain Estate
1 Concordia
1 Granard
Total 4 specimens.

References:

Grant, Chapman. Herpetological notes with new species from the American and British Virgin Islands, 1936. Jour. Agri., University of Puerto Rico, 1937, Vol. 21, pp. 503 - 522.

SYMMETRY & ASYMMETRY OF THE MEDIAN SUTURES IN REPTILIAN SCUTELLATION

By CHAPMAN GRANT

This paper concerns itself with the median dorsal and ventral sutures between scales or scutes which occur on certain parts of many reptiles. We will try to show that although these sutures are usually normally symmetrical and median, there is frequently, and naturally enough, deviation in some individuals of some genera; other genera inexplicably have a FIXED asymmetry.

Fixed symmetry is the usual condition found in the median sutures in reptiles of most genera. An example of this is the head of Ameiva. In this lizard the anterior nasals meet in a straight suture behind the rostral; the prefrontals meet similarly behind the frontonasal and the frontoparietals similarly behind the frontal. Fig. 1. The ventral plates border a straight median suture as is almost invariably the case in reptiles. Parenthetically, the single ventrals of snakes are a secondary adaptation for gliding.

Normal haphazard individual variation may show deviation of the mid-line suture in the head plates of many individuals of certain genera. In **Epicrates** and **Tropidophis** the species seem to be abandoning plates in favor of scales on the head and in this trend develop variations which distort the mid-line suture. Fig. 2. The head scales of **Xiphocercus valenciennesii,** a lizard in which no two specimens have head plates alike and with little bilateral symmetry, affords another example, Fig. 7.

An example of asymmetry of the mid-ventral suture is found in **Gopherus agassizii,** the California desert tortoise, wherein the writer has shown elsewhere that the left gular is almost always larger than the right. The distal end does not project farther forward on the left sde, but the base sets farther back on the plastron and is wider, thus making the base of the left gular project somewhat to the right, causing a deviation of the midline. The infrequent specimens wherein the suture is straight or the right gular larger are almost always females. **Fig. 3.**

What seems to be fixed asymmetry with a possible sexual significance is found in the preanals of certain snakes. The writer has studied **Alsophis, Dromicus,** and **Tretanorhinus** and has found that in both sexes the right half or the right scute of the anal flap is invariably the upper one, making the middle suture oblique to the left from the apex of the right half. Fig. 4.

Fixed asymmetry without apparent reason, is found in the head plates of various genera of lizards and snakes. At first glance this asymmetry seems trivial, and has therefore apparently escaped or been unworthy of the notice of herpetologists, but it seems remarkable to the writer that such trivial asymmetry should ALWAYS be in ONE direction in certain genera. A good example is **Celestus.** The writer took and had in his collection over 200 specimens of six species and subspecies of this lizard from Jamaica and there is not a single exception to the asymmetry of the suture between the supranasals, which always slants from **right** to **left,** from front to rear; and of the suture between the frontonasals which slants similarly. Fig. 5. This is well shown in Stejneger's Herpetology of Puerto Rico, (1904, p.623, fig. 74) in the figure of **Celestus pleii** (D & B.), while in his figure 73, which is merely a diagram to show the nomenclature of the head plates, the suture is shown in reverse. The writer believes that this is due to the plate having been accidentally reversed by the artist. Among snakes of the genera **Alsophis, Dromicus** and **Tretanorhinus** a similar right-to-left asymmetry occurs between the pairs of internasals and prefrontals, but not to a fixed degree. About 10% have reversed or left -to-right oblique sutures and about 10% have symmetrical sutures which brings them midway between the condition of normal haphazard asymmetry and fixed asymmetry. All of Stejneger's diagrams of the heads of Puertorican colubrid snakes show right-to-left asymmetry. Fig. 6.

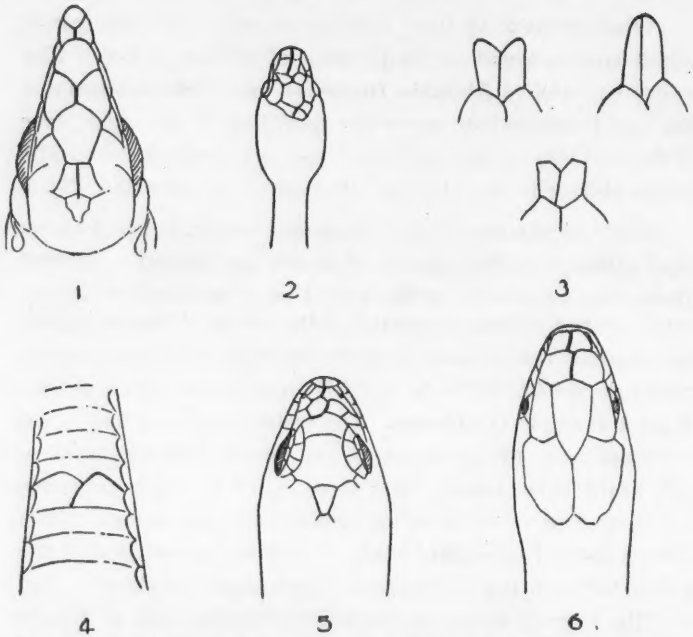


Fig. 1. Fixed symmetry shown by the median head sutures of **Ameiva.**

Fig. 2. Distortion of median sutures by individual variation shown by head of **Epicrates monensis.**

Fig. 3. Midventral distortion of median suture shown by gulars of **Gopherus,** wherein a secondary sexual trend is shown.

Fig. 4. Fixed asymmetry with probable sexual significance shown by split anals of **Alsophis** etc.

Fig. 5. Fixed asymmetry without apparent reason shown by **Celestus.**

Fig. 6. Asymmetry with an unfixed, but preponderant right-to-left distortion of mid suture.

Figs. 1, 2, 5 and 6 after Stejneger ,but with median sutures drawn heavy to illustrate point of the article.

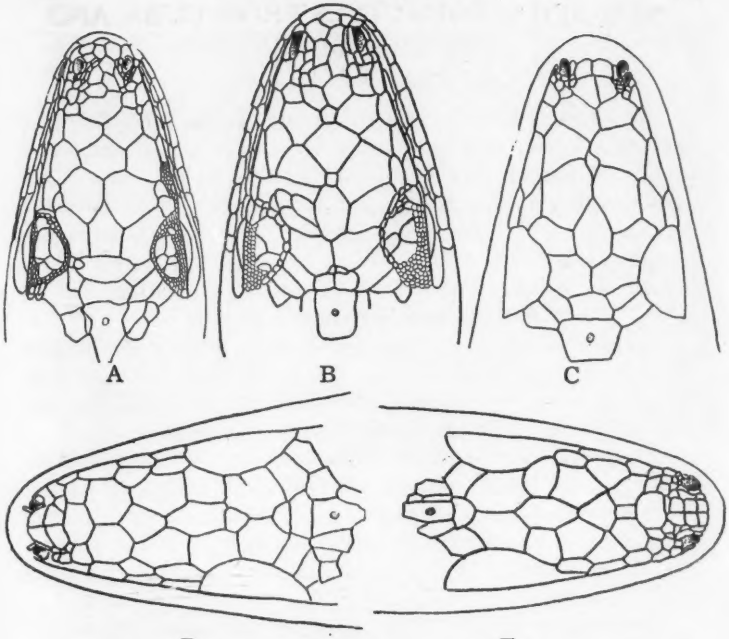


Fig. 7. Outlines of head plates of **Xiphocercus valenciennesii** to show asymmetry and individual variation. a. and b. show most of the lesser scales; c. d. and e. show only the large head plates. (Drawings by Mr. Norman Bilderback.)

References:

Grant, Chapman. The southwestern desert tortoise, **Gopherus agassizii.** Zoologica, 21, 1936: 225-229.

——— ——— Orthogenetic variation.. Proc. Ind. Acad. Sci. 46, 1937: 240-245.

——— ——— The "midventral keel" in Testudinata. idem. : 246-252..

Stejneger, L. The Herpetology of Puerto Rico. U. S. N. M. No. 129, 1904: 553-724.

NEW SPHAERODACTYLS FROM CUBA AND THE ISLE OF PINES

By CHAPMAN GRANT

Mrs. Grant accompanied the writer on Dec. 18, 1941, in a "popular" automobile over about 25 miles of Cuban staircase-road to the coast from Central Soledad, Cienfuegos, Cuba. Our point of departure was Harvard House. Near the coast the foundation of a dismantled cabin and some boards and trash on the ground harbored some very agile sphaerodactyls which seem to be undescribed. The species may be called;

Sphaerodactylus oliveri, sp. nov.

Type:- No. 185, Grant Cuban Collection, adult male, Rancho Gavilan near Cienfuegos, Cuba. Dec. 18, 1941: C. Grant coll. Paratypes Nos. 186-9, Grant Cuban Collection. M. C. Z. Nos. 19,-568; 19,901 and 22,717 are also designated paratypes.

Diagnosis:- The only recorded Cuban form with a middorsal granular zone besides **scaber** from which it differs in having 8 - 11 granular dorsals instead of 5 - 6 tectiform dorsals in distance equal to that from snout to center of eye; dorsal maculation of spots instead of crossbands which are found in the young of **scaber.**

Description of type:- Snout rather short; upper labials narrow, 3 to under center of eye; one very large lower labial followed by a small one which is followed by two very small ones; eye nearer to ear than to tip of snout; an eye spine; head, throat and sides of neck covered with fine granules which increase in size and become hexagonal on snout and lores; supranasals and one included scale border rostral; about 9 - 11 large dorsal granules equal to distance from snout to center of eye; a middorsal zone of fine circular or sub-hexagonal granules from lower neck to sacrum, from one to four granules wide; smaller granules one-fourth size of large dorsal granules which are very slightly keeled, juxtaposed, non-imbricate; large granules decrease in size slightly ventrally; 10 longitudinal rows on each side of granular zone, 37 transverse rows from axilla to groin; 2 large postmentals followed by three rows of large flat scales, then grading into fine throat granules, enlarging again

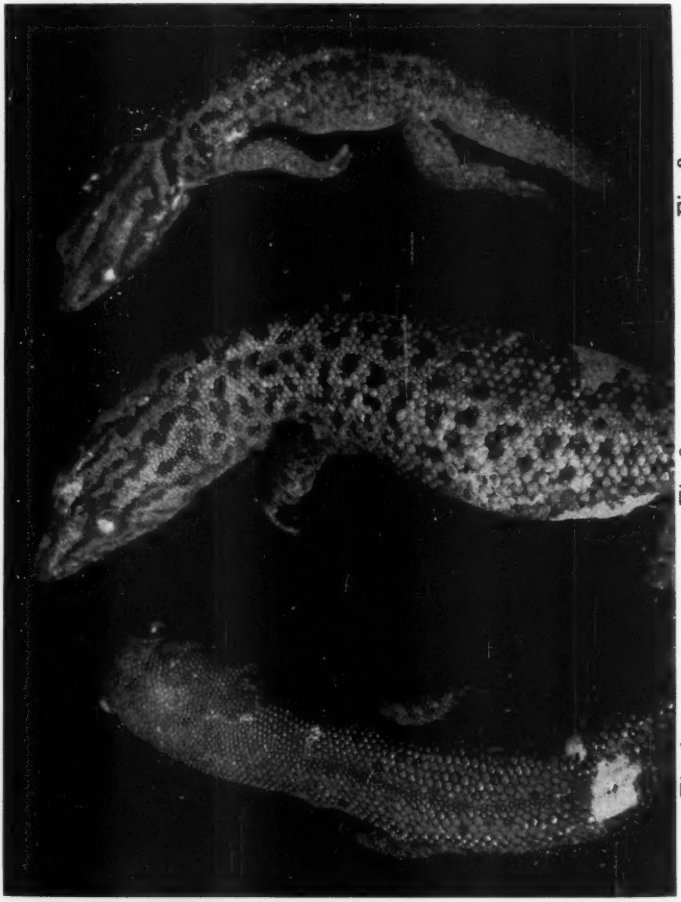


Fig. 1. **Sphaerodactylus oliveri**, type, male, 185, Grant Cuban Coll.

Fig. 2. Same, female, Grant Cuban Coll.

Fig. 3. Same, immature female, Grant Cuban Coll.

(Photo by Lee Passmore).

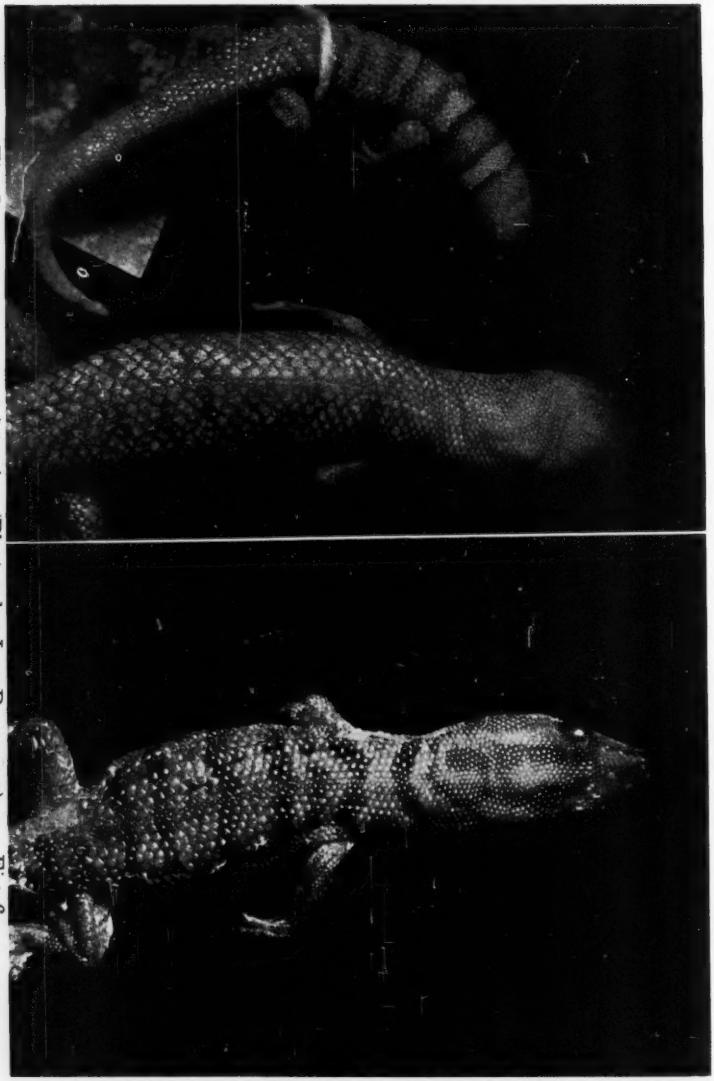


Fig. 4. **Sphaerodactylus scaber,** male, M. C. Z., 7952.

Fig. 5. Same, immature female, M. C. Z., 13440.

Fig. 6. **Sphaerodactylus storeyae,** type, immature female, N. H. Mus., Stanford U., R9296.

Fig. 5 Fig. 4 (Photos by Lee Passmore) Fig. 6

on neck where they become cycloid and imbricate, enlarging again on chest and becoming large ventral scales; about 20 longitudinal rows of ventral scales and about 40 transverse rows from vent to upper chest; anterior surface of limbs with cycloid scales, remainder of leg, groin and axilla granular; top and sides of tail with scales similar to dorsum, but smaller, underside with large irregular cycloid scales; a regenerated tail as in type with wide scales below; escutcheon poorly defined, 3 scales long with short branches onto thighs.

Variations:- One male has escutcheon 5 scales long with branches onto thighs two scales wide proximally. The variation in this character is probably correlated with age. Upper labials range from 3 to 5.

Dimensions:- Body 30 mm.; tail, regenerated, 34.

Proportions:- Regular for the genus; perfect tail longer than body.

Color pattern:- There appears to be a progressive change in color pattern with age, but our series is too small to prove this. Males: above plain slate-gray or with small scattered brown spots involving only 1 or 2 scales, Fig. 1.; below yellowish or grayish with faint pigmentation on edges of cycloid scales of posterior venter; escutcheon clear. Females: striped head pattern seems to fade or simplify with age; dorsum and sides light greenish gray spotted with dark brown, spots involve 1 to 3 scales on back, 6 or more on neck where spots begin to form lines; 3 brown stripes from snout, outer ones passing through eye and forming a loop or stripe behind eye; central stripe divides between eyes, each branch forming a loop or bar on top of head, Fig. 2.; younger females with stripes from below eyes to throat in a pattern reminiscent of that found in **richardsoni;** chin and underside of tail dotted; belly yellowish gray.

Sexual dimorphism:- Escutcheon present in males only.

Relationships:- The only Cuban form heretofore described with a middorsal granular zone is **scaber** which has about 25 large keeled dorso-lateral scales from axilla to groin. The present form has about 37 large granules in the same distance. The female does not have the cross bands mentioned by Barbour for **scaber.**

Mrs. Helen T. Gaige kindly loaned us 2 specimens of **scaber,** No. 90,603 (2) from the Mus. Zool., U. of Mich. One is an adult from which we obtained the above counts and which shows that there are 8 rows of dorso-lateral scales on each side, from the middorsal granular zone to the lower lateral granules. The new form has 10 rows on each side. The smaller specimen loaned by Mrs. Gaige clearly shows the transverse bands mentioned by Barbour, p. 216. Neither sex nor the young of our species shows any indication of transverse markings.

Mr. Loveridge suggested that we examine the series of **scaber** in the M. C. Z. Seven specimens were obligingly loaned. No. 7,952, Sierra de Jatibonico, is an adult male, Fig. 4. The fine dorsal granules are confined to a short series near the nape and at the sacral region. There appears to be a raised ridge or crest along the back, but this is probably due to the method of preservation. No. 13,440, north coast of Camaguey, the only one of four paratypes received, Fig. 5., appears to be a partially grown female with a continuous row of middorsal granules. The color pattern consisting of four dark-bordered cross bands with no trace of longitudinal markings anterior to the sacrum.

Many species of this genus have an interocular stripe which may be light or dark according to species. When present it is very diagnostic because no species has both a dark **or** a light stripe. However in some species the stripe is present in immature specimens only. When a stripe is present in **oliveri** it is **light.** Nos 19,902 and 19,904, M. C. Z., listed as **scaber** have a **dark** interocular stripe, blunt snouts and no middorsal granules and therefore apparently belong to some other species.

M. C. Z. Nos. 19,568; 19,901 and 22,717 from Loma del Niarin, Trinidad, Cuba; Cienfuegos and Soledad resp. are typical **oliveri.**

The sepcies is named in honor of Dr. James A. Oliver.

Discussion:- Barbour and Loveridge express some uncertainty as to the validity of the species as the following communications indicate.

We had written Mr. Loveridge that our new species had about 9 to 11 dorsals in a distance equal to the distance from snout to center of eye whereas the original description by Barbour and Ramsden gives "about seven" in the same distance. Barbour (1921: 261) says "about six" for the same count. Therefore Loveridge's letter of Oct. 20, 1942 was surprising. He says; "I have carefully examined the type of **S. scaber** and find that it has 8 - 9 dorsals in a distance equal to that of from end of snout to center of eye. I am not implying that your species is no good but I would suggest that you examine our entire series of **scaber**, before publishing."

We requested the loan and Mr. Loveridge wrote Oct. 29, 1942 that he was forwarding the specimens and that he had " . . gained the same impression regarding the color differences . . " that we had mentioned. The specimens arrived and an inspection gave us the impression that the series contained three distinct species. We wrote Nov. 9, 1942 to Dr. Barbour:

"There are two distinct species of **Sphaerodactylus** in Cuba with a middorsal zone of fine granules. Both have similar proportions:

(a) Dorso-lateral scales, 6-7 in standard distance, tectiform, imbricate, POINTED; males unicolor (?), females ringed (?), young ringed.

(b) Dorso-lateral scales 9-10 in standard distance, in the form of LARGE GRANULES; males specked, females spotted with striped head, young LIKE ADULT.

The original description by B. & R. is of (a) and paratype No. 13,440 is distinctly (a) as is also No. 7,952..

Nos. 19,568; 19,901 and 22,717 are definitely (b). Nos. 19,902 and 19,904 are definitely neither (a) nor (b) as neither has middorsal granules, they have large heavy heads, the inter ocular-occipital stripe is DARK whereas in (a) and (b) where present, this stripe is light.

I would like answers to the following: 1. Are 19,902 and 19,904 catalogued **scaber?**

2. Has the type, No. 12,304, got the tectiform, imbricated, sharp-pointed scales, 6-7 in standard length?

From Mr. Loveridge's letter it would appear that (a) was described and then the type selected from (b)."

Mr. Loveridge answered Nov. 11, 1942; "Yes, the series 19,-902-4, collected by E. R. Dunn in July-August 1924, were catalogued as **scaber.**

M. C. Z. 12304 is undoubtedly the type, it has only 8 imbricate dorsals (in standard length) in places where there are a couple of reduced scales, elsewhere—and I have now tested it at many different points—there are seven so it fits your (a) all right, and (b) stands as the one to be described . . . I am glad that you have got the matter straightened out."

We then finished our MS and sent it with the illustrations shown in this article. We were surprised to receive the following from Dr. Barbour dated Dec. 10, 1942. "In the opinion of both Mr. Loveridge and myself the Gavilan sphaerodactyl is nothing more or less than **S. scaber, . . .** "

Barbour and Ramsden's original description of **scaber** reads in part; ". . back covered with large, heavily keeled scales which are about as long as broad . . . scales of the back very large (comparatively speaking), heavily keeled, imbricate, giving a rough appearance;".

It seems to us that the scale and pattern differences shown in the figures are sufficient to warrant a separation into species. More collecting may show that these two forms intergrade somewhere, but until the intergrades are found we believe that the differences apparently are greater than in many species of unquestioned validity.

We thought that the matter was closed, but a letter from Mr. Loveridge dated Dec. 24, 1942, states: " . . I have not changed my opinion regarding its status in the least, as I recollect I had misgivings about there being any actual difference in scalation, the pattern suggested there might be a color form, if the differences were not sexual, if correlated with distribution for I did not know where your alleged new form came

from. Dr. Barbour, who knows these creatures in life, which I do not, considers them highly variable and our material seems to bear this out."

The Natural History Museum of Stanford University lists a specimen as **scaber** which was loaned us by Miss Margaret Storey. The data are: "Isle of Pines (?) Heath and Taylor (?) det. B. Shreve. No data in with specimens sent by James P. Heath. Color a bit different?" This specimen seems to be the Isle of Pines derivative of **oliveri**. It may be called,

Sphaerodactylus storeyae sp, nov.

Type:- No. R9296, Nat. Hist. Mus., Stanford University; Isle of Pines (?), Heath and Taylor coll. (?), Aug., 1941; an immature female.

Diagnosis:- Differs from **oliveri** in color pattern and larger dorsal granules, having about 28 from axilla to groin as compared to 37 in **oliveri.** Differs from **scaber** in having granules instead of pointed imbricate scales and in pattern.

Description of type:- Proportions and squamation as in **oliveri** except for larger dorso-lateral granules which number about 28 from axilla to groin. Color pattern: a dark stripe from snout to eye, branching behind eye into three; 6 dark cross stripes from nape to sacrum inclosing lighter broken stripes; all lines uneven and not clear-cut as in **scaber.** Adults not known.

Named in honor of Miss Margaret Storey, Palo Alto, Calif.

Mr. Lee Passmore obligingly made the photographs for Figs. 1-6.

References:

Barbour, Thomas and Charles T. Ramsden, The herpetology of Cuba., Mem. M. C. Z., Vol. 47, 1919.

Barbour, Thomas, Sphaerodactylus., Mem. M. C. Z., Vol. 47, 1921.

Grant, Chapman, The herpetology of Jamaica., Bull. Inst. Jamaica, Sci. Ser. No. 1., 1940.

DIGITAL LAMELLAE AND NOTES ON WEST INDIAN HEMIDACTYLS

By CHAPMAN GRANT and JAMES T. DEUEL

This paper was undertaken to determine whether there is any value in digital lamellae counts of West Indian hemidactyls and whether the count of the paired lamellae only would not be more stable and diagnostic than the total count. The junior writer painstakingly made the lamellae count of every uninjured toe in a series of thirty-five specimens, repeating his counts a second time.

The senior writer has collected and published on **H. mabouia** (M.de J.) and **H. brookii** Gray from the Puerto Rico - Virgin Island area, but it was not until December 14-24, 1941 that he collected **H. turcicus** (L.) This was at the Central Soledad, Cienfuegos, Cuba. The senior writer and Mrs. Grant are indebted to Dr. Barbour for the hospitality of Harvard House and a glimpse of very interesting territory whither they hope to return.

It was found that **turcicus** has about the same habits as its congeners, gathering about brilliant electric lights where insects are attracted to white walls. In this case it was the lights on the white porch ceiling of the administration building of the Central which had attracted dozens of the geckos. We took 35 in about as many minutes, shooting into groups huddled in the corners, securing several at a shot. We captured several by hand on the walls to determine whether they have vocal powers like **mabouia** and **brookii**, but did not detect any sound.

This species has possibly multiplied rapidly in recent years since it was first recorded from Cuba in 1933 by Leavitt who said that it was his good fortune to collect "a" specimen at Central Soledad. Loveridge p. 245 says that "relatively few" **turcicus** have been taken in the New World. In answer to a query, he wrote on May 22, 1942, that his satement was based on three specimens. Possibly these were Leavitt's and two from Key West.

We believe that **turcicus** found its way into museums from Cuba long before 1933 because Barbour, 1919, p. 117 in describing M. C. Z. 8,502 as **mabouia** from Cuba says it has 14 to 16 rows of dorsal tubercles. This makes it appear that he did not confine his remarks to the one specimen since one specimen has 14 **or** 16 rows. Furthermore 14 or 16 rows is a specific character of **turcicus.** Therefore M. C. Z. 8,502 must be **turcicus** since **mabouia** has only 12 rows. He goes on to say that it has 14 or 15 pores on each thigh which shows that that particular specimen was a male **mabouia.** He says that the tail has whorls of six spines, which is a character common to both **mabouia** and **turcicus.** He further states that the M. C. Z. has specimens of **mabouia** from Puerto Rico. We believe that **brookii** is the only species found on Puerto Rico and that therefore, if his locality labels were correct, he could have had three species of **Hemidactylus** before him while describing **mabouia** from Cuba. We have never seen more than one species of **Hemidactylus** on one island, but Barbour lists three from Cuba and there is no reason to doubt this except for possible misidentifications.

The senior writer published on the hemidactyls of the Puerto Rico - Virgin Islands area in 1932 and 1937, making a key which served for indentifying several hundred specimens of **brookii** and **mabouia.** The only character needed was a count of the spines at the base of the tail which are 8 (rarely 10) in **brookii** and 6 in **mabouia,** but **turcicus** also has 6. To enlarge the key to include **turcicus** we need look no farther than the number of rows of dorsal tubercles which are always 12 on **mabouia,** 14 (rarely 16) on **turcicus** and 18 on **brookii.**

Dr. Cochran adopted our key for Haiti whence only **mabouia** and **brookii** are recorded.

Loveridge said that he did not find the pore charater adopted by Cochran from the senior writer sufficiently reliable for differentiating **mabouia** from **brookii.** This character is that the pores are interrupted at the midline in **brookii** and not in-

terrupted in **mabouia**. All we can say is that this character was 100 per cent correct in the several hundred specimens we examined.

Loveridge divides **brookii** into four subspecies and furnishes a key. He contrasts **b. brookii** and **b. subtriedroides** to **b.angulatus** and **b.haitianus** in that the former have normally less than 13 pores on each side and the latter more than 13, but may have as few as 10.With this start limited to adult males and with an overlapping of characters he separates a series of **b. brookii** from 3 larger male **b. subtriedroides** on length of tail spines and number of pores, but the range of pores of the latter, 6-8 is included in that of the former, 5-13. The separation of **b. angulatus** from **b. haitianus** is made on identical size and that the former has trihedral tubercles, 8 upper labials and 8 tail spines whereas **b. haitianus** has flattened tubercles, 10 upper labials and 6 tail spines. Our Puerto Rico count of **b. haitianus** was 9 upper labials, but unfortunately labial counts are in many species subject to personal interpretation. We would prefer to consider **H. brookii** as a full species until intergradation is found, since the number of tail spines seems to be constant and consequently of full specific value. Loveridge divides **turcicus** into three subspecies, but does not furnish a key or give zones of intergradation. He separates **brookii** from **turcicus** by a key which employs lamella and pore counts. The lamella counts overlap considerably and are difficult to count in some cases. The pore count serves only for adult male specimens. He makes the following separation on lamellae.

	1st toe	4th toe
H.brookii	4-6	7-9
H.turcicus	6-8	9-10

It is evident that a female specimen with 6 lamellae on 1st toe and 9 on 4th might belong to either species as far as his key is concerned.

We believe that a key should be as positive and as easy to use as practical and that a count of dorsal tubercle rows is easy to make on any specimen regardless of size, sex or condition.

However, a key should contain as many practical factors as can be used to advantage. We submit the following tabular key for the three species in question:

	rows of dorsal tubercles	spines at base of tail	femoral pores on each side	pores interrupted at midline	Color pattern
Mabouia	12	6	16-17	no	6 "V"s
turcicus	14-16	6	3-4	no or partially	spots
brookii	18	8-10	13	yes	4 circles or marbled

The junior writer's counts show that there is a distal single lamella followed by a series of paired ones which in turn are followed by a series of single ones. It appears that there is slightly less variation in the paired than in the single lamellae. We had been of the opinion that a count of the double lamellae only might show a character with much less variation and consequently of more diagnostic value than a count of all the lamellae. The fact is that the lamella between the paired and single ones is subject to interpretation at times, since it may be nicked, creased or almost divided. Therefore the old system of counting all the lamellae cannot be improved upon in this genus. However, the lamellae count in the three known West Indian species of this genus are unnecessary inter se in diagnosis.

The junior writer made a description from the entire series, following the sequence and form used by the senior writer, who had followed Stejneger, in describing **mabouia** and **brookii** in 1932. This is for ease in comparison.

Hemidactylus turcicus (L.)

(See Loveridge for synonymy)

Diagnosis:- A gecko with 14, rarely 16, rows of dorsal tubercles; spines in whorls of 6 at base of tail; flesh color with small brown spots.

Range:- Barbour and Loveridge restrict it in the West Indies, to Cuba.

Proportions:- Tail about equal to body in young specimens, but about 55% of total length in large specimens. In our series of 35 only one male and 6 females had what appear to be perfect tails. Large specimens about 60 mm. snout to vent.

Squamation:- Rostral broader than high, squarish, split nearly to lip, bordered above by supranasals and one internasal, first supralabial in contact with lower postnasal and reaching nostril; 8, occasionally 7 or 9 (in one case 6 and one case 10) supralabials with a mean of 7.89; this count includes a small posterior labial; the seventh, occasionally 6 or 8 (in one case 9) supralabial under center of orbit with a mean of 7.03; top and sides of head covered with fine granules of various sizes, interspersed with small circular, convex, unkeeled tubercles, spaced about 4 granules apart, there being about 14, range 10-18, tubercles from ear to ear; granules enlarged on snout, especially on rostral canthus; pupil vertical, eye equidistant from nostril and ear. its diameter being about one half its distance from tip of snout; 5 or 6 distinct, black-tipped spines on posterior edge of rudimentary eyelid; ear opening oblique, elongated; mental triangular, as wide as rostral; 7 infralabials, occasionally 6 or 8, mean 6.84, four chin shields, center pair much the larger, irregularly pentagonal, their anterior angles fitting into the angle between mental and first and occasionally part of second infralabials, usually not in contact on the median line because of a submental, several rows of elongated scales border the lower labials. There is considerable variation in the squamation of throat and chin. Upper surface of body and flanks and hind aspect of legs covered with granules like those of head; upper surface of body bearing 14, rarely

16 fairly even rows of tubercles, subconical and radially ridged, separated front to rear of same row by from 3 to 8 granules; tubercles about 4 or 5 granules long; no wide strip of flank without tubercles; rear aspect of legs bearing scattered tubercles; throat covered with small flat uniform granules in strong contrast to the imbricate cycloid scales of the rest of underside which also cover the anterior aspect of legs and extend along sides of tail, said scales being smaller than the dorsal tubercles; in from 38 to 45 rows across midbelly, about 140-150 to the row, chin to vent; anterior to vent a diamond-shaped escutcheon of enlarged scales; in males 3 and in females one outer series of scales under the thighs is enlarged; in males the anterior scales bear narrow pores extending across the upper part; pores occur in from 6 to 8 scales, the series partially or not interrupted at midline; vent edged with fine scales; on each side and close to the ends of the cloacal slit there is a pair of tubercles, the medial the larger. These cloacal tubercles occur on both sexes and are visible on young specimens; occasionally a smaller isolated tubercle occurs between them and the lowest row of caudal tubercles; a longitudinal umbilical scar frequently visible anterior to escutcheon; fingers and toes free, all with long, compressed, angularly raised and clawed distal phalanges; basal dilated portion bearing 2 to 7 paired lamellae between one distal and one or more proximal single ones; tail sub-cylindrical, a dorsal shallow groove extending from base nearly to tip; upper half covered with striated scales slightly larger than the granules of the back and three rows of long pointed, radially ridged spines in whorls on each side of tail, the number of spines reduces and disappears distally; whorls about 4 scales apart and spines about the breadth of 3 scales; scales surrounding each spine slightly enlarged, tail enlarged at each whorl, underside always with a median series of large plates which begins behind the 7 or 8 rows of pointed scales and possibly one or two divided plates, about 2 to a whorl; tail slightly larger in diameter at the point of juncture of the pointed scales and plates forming the point of cleavage when tail

is mutiliated; this point is anterior to the fourth verticil; a regenerated tail is covered with scales about 4 times the size of dorsal granules and is at first without whorls, spines, enlargements or large lateral cycloid scales, but does have the large median plates on the underside and the groove above and ultimately apparently assumes a nearly normal appearance.

Color pattern:- Entire body almost transluscent flesh-color spotted above with round brown markings somewhat larger than the tubercles; background finely dotted with minute specks; occasionally underside also dotted; tail conspicuously barred with about 12 pairs of dark bands becoming darker caudad and finally coalescing into simple dark or nearly black rings. The tail is the only conspicuous part of the lizard. There is no pattern as in **mabouia** and **brookii.**

Sexual dimorphism:- Male bears a short angular series of preanal pores; frequently the pore is filled with a yellow substance about four times as great in area as in the two other species; when the yellow substance is missing the pores are difficult to detect. They number from a few to 8, but usually 3 on a side; series occasionally partially interrupted at midline by the point of a scale; females without pores; head of male somewhat heavier especially at the jowls; this series is not large enough to determine difference in size, but it appears that the males are slightly the larger. All males have 14 rows of tubercles, 1 female has 15 and 2 have 16 rows.

Relationship:- Well differentiated from either **mabouia** or **brookii.** The preanal pores seem to show the widest fixed variation among the three species.

Selection of digits for lamella counts for diagnostic purposes:- The first or inner digit is the smallest in this genus. The other four digits are approximately of the same size so there is no particular choice as in the Anoles where the fourth toe is long and consequently the lamellae easily counted. There is a decided choice however, among the digits as to range of lamallae since some have a narrow and others a wide range as the table shows. We may term a range of 2 as "small", 3 "medium" and 4 "large".

Lamella Range

digits	1	2	3	4	5
fingers	3	3	3	3	2
toes	2	3	2	4	4

Various writers chose the digits best suited to their problem or fancy in their descriptions as follows:

Stejneger (brookii) 1st and 3rd toes — small range.

Smith, 1st and 3rd toes and fingers—small and medium range.

Loveridge, 1st and 4th toes—small and large range

The junior writer made an analysis of the lamella counts, but found no sexual dimorphism or bilateral asymmetry in our small series. The following table shows by digit the count by pairs and single lamellae as to mean, usual and range. We use the term "usual" instead of "normal" since Loveridge has used "normal" in the sense of contradistinction to abnormal or diseased in his key, p. 246. We question the wisdom of recognizing abnormal or diseased specimens in a key, but we are grateful for the proper and correct restriction in the use of "normal".

Discussion:- In describing **mabouia,** Boulenger, p. 122 says "Male with . . . 15 to 30 . . . pores on each side . . . " There is practically no variation in the number in **mabouia** so it would appear that he means 15 on one side or 30 in the whole series, but he does not say so as he specifically does in other species. In his key, p. 115 he again says; "15 to 30 femoral pores on each side". Thus it is clear that he either meant 15 on each side or he had a composite of several species or a different species. The text of his description differs from our findings in the following points. He says "snout covered with small convex granules . . . 10 to 14 upper labials . . . dorsal granules mixed with small irregularly scattered . . . tubercles." We find the granules greatly enlarged on snout; 12 upper labials; 12 fairly even rows of tubercles. Boulenger's description of

turcicus, p. 127 shows that his specimens, undoubtedly Old World examples, either varied more than ours or he had a composite group. The same may be said of his description of **brookii**, p. 128. His lamella counts might be of value to separate these three species from others, but are of little value between the three.

H. exsul Barbour & Cole synonymous with **H. turcicus** (L).

Barbour and Cole described **H. exsul** from Yucatan in 1906. There appears nothing in the description to set it off from **turcicus.**

Barbour and Loveridge, p.274, say of this species; "Improbable, we admit, but this seems to be a valid species. The generic identity is certain."

Stuart says: " . . one of the most interesting novelties described from the North American continent was undoubtedly the Yucatan **Hemidactylus exsul** Barbour and Cole . . . Upon my request Dr. Barbour re-examined the type, and I have since gone over the specimen personally. We are agreed now that **Hemidactylus exsul** should be relegated to the synonymy of **H. turcicus . . . .** " He explains verbally that **exsul** was supposed to have speciated from the parent stock **after** arrival in the New World. This would indeed have been most interesting.

Smith, p.133 says; "Stuart states that **H. exsul**, described from Yucatan, is a synonym of **H. turcicus**".

Loveridge includes it in his synonym of **turcicus turcicus.**

A letter dated Dec. 21, 1924, from Charles M. Bogert says: " . . among a series of 78 African **H. mabouia** that I examined . . three . . had the femoral pore series separated medially. Thus, the usefulness of this character cannot be denied, since the variation is certainly not sufficiently extensive to preclude its use in a key, although some sexual dimorphism is present in some forms that detracts from its usefulness . . . (In) Parker's recent (1942) paper on the lizards of British Somaliland he recurs to the use of the binomial for **turcicus** and recognizes both **macropholis** and **sinaitus** as distinct species, in contrast to the conclusions drawn by Loveridge. These geckos

present some tough problems further complicated, no doubt by their introduction through human agency into various parts of the world."

While verifying certain data presented by Smith the following remarks about **exsul** were made. Letter from Dr. Smith dated Aug. 26, 1942; "Mexico has another **Hemidactylus,** but it is a Pacific coast species, **frenatus.** Perhaps Barbour's **exsul** is valid after all?"

Letter from Dr. Edward H.. Taylor, University of Kansas, Sept. 8, 1942; 'I have not seen Barbour and Cole's type of **Hemidactylus exsul.** I am willing to agree that the opinion of Stuart and Barbour should be followed."

Dr. Taylor forwarded 3 specimens of **Hemidactylus.** His Nos. 11388, Progresso, Yucatan, Mexico, Aug. 2, 1936; 11399 and 11422 Ciudad de Carmen, Campeche, Mexico, Sept. 4, 1936. He remarked that they are probably the same as **exsul.** The writers examined these three specimens which agree with the Cuban series of **turcicus** except that the dorsal tubercles appear to be slightly small in proportion. We see no reason for reviving **exsul** on the strength of Dr. Taylor's specimens.

The above correspondence was started because Dr. Smith, p. 133 said of two specimens of **H. turcicus,** Nos. 1515 and 1516; "Ventral scales, longitudinal count 42,49." The junior writer counted six specimens of our series chin-to-vent; males, 137,-143,147; females, 144,145,157. This is a tedious count to make and is of no particular known value, but Dr. Smith's "42" and "49" required investigation to determine whether he and we had the same species before us. Dr. Smith wrote under date of Aug. 26, 1942 that he did not remember how the counts were made and that he was referring the matter to Dr. Taylor. Dr. Taylor wrote Sept. 7, 1942 that the two specimens listed were not available, but that he was sending 3 specimens from southern Mexico. He again wrote Sept. 8, 1942, that he suspected that the counts were transverse rather than longitudinal. This was evidently the case, as our transverse counts agreed with those of Dr. Smith.

While collecting in Puerto Rico and the Virgin Islands the

senior writer heard legends that tend to explain the fear that the natives have for these harmless lizards. One is that they adhere to one's flesh and can be removed only by applying a hot iron. Another version has it that playing a fiddle will detach the reptile.

A reference; Six months in the West Indies in 1825., Henry Nelson Coleridge, M. A., London, 1832, p.113, under the chapter on St. Lucia: " . . in old and ill kept rooms, snakes and wood-slaves love to dwell, and the natives tell direful stories about the poison of the first and the tenacity of the second. However, I never met any person who had known an instance of the wood-slave fixing itself upon a human being, though everybody seemed to believe the story. The negros have a particular aversion to them from a notion that contact with them will produce leprosy."

Conclusions:- For diagnostic purposes all lamellae of a toe should be counted. This character is unnecessary in separating the three West Indian species. These are best distinguished by count of rows of dorsal tubercles: **mabouia** 12, **turcicus** 14-16, **brookii** 18.

References:

Barbour, Thomas. 1919 — A contribution to the zoogeography of the West Indies, with especial reference to amphibians and reptiles., Mem.M.C.Z., Vol.47,pp.71-213, pl.

1935 — A second list of Antillean reptiles and amphibians., Zoologica, Vol.19, pp.77-141.

1937 — Third list of Antillean reptiles and amphibians., Bull. M.C.Z., Vol. 82, pp.77-176.

and Charles T. Ramsden. 1919 — The herpetology of Cuba., Mem.M. C.Z., Vol47,pp. 71-213,pls.1-15.

and Leon J. Cole. 1906 — Vertebrata from Yucatan . . .reptilia; amphibia . . , Bull. M.C.Z., Vol.50,pp.101-159, (146-155).

and Arthur Loveridge. 1929 Typical reptiles and amphibians., Bull.M.C.Z.. Vol.59,pp.205-360.

Boulenger, George Albert. 1885 Cat. Liz. Br. Mus., Vol. 1,pp.1-436.

Cochran, Doris. 1941 The herpetology of Hispaniola., U. S.N.M.,Bull.177,pp.1-398, figs.

Grant, Chapman. 1932 The hemidactyls of the Puerto Rico region., Jour. dept. Agri. Puerto Rico Vol. 15, pp.51-57, pl.10.

1937 Herpetological notes with new species from the American and British Virgin Islands., idem., Vol. 21,pp.503-522.

Leavitt, Benjamin B. 1933 Hemidactylus turcicus in Cuba., Copeia,p.96.

Loveridge, Arthur. 1941 Certain Afro-American geckos of the genus Hemidactylus., Copeia, pp.245-248.

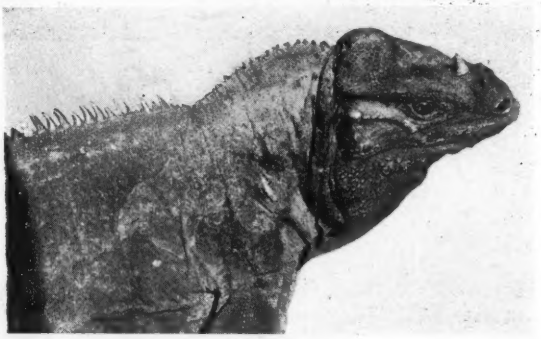
Smith, Hobart. 1935 Miscellaneous notes on Mexican lizards., Bull.U.of Kansas, Vol.36, pp.119-155,pls.23-25.

Stejneger, Leonhard 1904 The herpetology of Puerto Rico., Smithsn., Inst. No. 129,pp.553-724, illus.

Stuart, L. C. 1934 Concerning Hemidactylus exsul Barbour and Cole., Copeia,p.185.

CYCLURA STEJNEGERI — A PORTRAIT

By CHAPMAN GRANT



Cyclura stejnegeri, Barbour and Noble. (Photo by Writer).

Pictures of preserved specimens of **Cyclura** give such a poor impression of this handsome animal that the writer wishes to present a good likeness in the accompanying cut. These giant lizards are fairly abundant on Mona Island, west of Puerto Rico, where they are safe from mongoose and little troubled by man. Viewed from the sea the island looks like a giant chocolate layer cake—sheer walls, a frosting of dark stunted vegetation, a layer of white limestone, a stratum of dark chocolate color which probably denotes a one-time sea level, another layer of white limestone, and the sea serves as a blue platter. The structure is porous, exposing knife-like edges so hard that they ring like porcelain if trodden on. Leather shoes are cut to bits in no time, but rubber composition soles withstand the "diente de perro", dog-tooth formation nicely. The stunted vegetation and masses of cactus from ankle to waist high, make the cyclura stand out in comparison like a dinosaur.

FORE FOOT

	1st digit			2nd			3rd			4th			5th		
	m*	u*	r*	m	u	r	m	u	r	m	u	r	m	u	r
terminal lamella	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
pairs of lamellae	2.55	2-3	2-3	4.85	4-5	4-6	5.03	5	4-6	5.32	5-6	5-6	4.94	5	4-6
single lamellae	3.26	3-4	2-4	1.36	1-2	1-2	1.85	1-2	1-3	1.85	1-2	1-3	2.91	2-3	2-4
total lamellae	6.81	6-7	5-7	7.21	7-8	6-8	7.87	7-8	7-9	8.17	8-9	7-9	8.85	8-9	8-9

HIND FOOT

terminal lamella	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
pairs of lamellae	2.52	2-3	2-3	5.02	5	5-6	5.83	5-6	5-6	5.98	6	5-7	5.37	5-6	5-7
single lamellae	2.85	2-3	2-4	1.82	1-2	1-3	1.50	1-2	1-2	2.51	2-3	1-3	3.33	3-4	2-5
total lamellae	6.37	6-7	6-7	7.85	7-8	7-9	8.33	8-9	8-9	9.49	9-10	8-11	9.70	9-10	8-11

* * * m, u, r, — mean, usual, range.

On the writer's first trip he shot an adult and a very young specimen because the literature on the subject stressed the rarity of the species and the difficulty in securing them. Upon the second trip these beautiful animals were studied and the subject of the photograph captured. This is reminiscent of a like experience on Anegada where the report was that the last survivor of the race had been taken with much difficulty. Two **Cyclura pinguis** Barbour, were therefore immediately shot and it was not until the second trip, some years later, that real pleasure was experienced in the study of the living specimens.

To go back to Mona. The **Cyclura** is timid and will retreat from a man by running into a rock hole, but ostrich-like the tail is not always withdrawn. Our subject was careless about this, so by slipping up quietly the tail was grabbed and snubbed against the edge of the hole. Care was taken not to bend it too much. The other hand, gloved, was then inserted and the two hind legs grasped and brought together so that they could be managed with one hand, then the lizard was carefully disengaged from the hold it had with its fore feet. When part of its body appeared, the knee was held against it so that it could not turn on its tormentor. It was then extracted, being crowded against the side of the entrance by the knee until the neck appeared when the hand holding the tail was shifted to the neck and the knee to the middle of the back. An assistant held a sack into which the squirming animal was dropped. This beautiful specimen was offered to the N. Y. Zoological Society, but unfortunately the transportation charges from Puerto Rico were too much so the specimen was given a hypodermic of strychnine and is now in the Museum of Zoology of the U. of Mich.

Three plates of living **C. pinguis** are to be found in the Journal of the Dept. of Agri. of Puerto Rico, Vol.16,No.3.., July, 1932. Plates of living **C. caymanensis** B&N appear in Bul. Inst.Jamaica,Sci.Ser.No.1, 1941.